**K NEAREST NEIGHBOUR**

# **DATATYPES: Here the output data is categorical type and the input is continuous data type**

## **SYNTAX:**

**Wbcd<-wbcd[-1] # Remove the first column in the dataset**

**Table(wbcd$diagnosis) # Calculating number of enteries with Band M**

B M

357 212

**wbcd$diagnosis<-factor(wbcd$diagnosis,levels=c(“B”,”W”),**

**labels=c(“Benign”,”Malignant”))**

**# Giving fullnames to the variables**

**Round(prop.table(table(wbcd$diagnosis))\*100,digits=1)**

**# Calculating the probability**

Benign Malignant

62.7 37.3

**Summary(wbcd) # Summary of the dataset**

diagnosis radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean

Benign :357 Min. : 6.981 Min. : 9.71 Min. : 43.79 Min. : 143.5 Min. :0.05263 Min. :0.01938

Malignant:212 1st Qu.:11.700 1st Qu.:16.17 1st Qu.: 75.17 1st Qu.: 420.3 1st Qu.:0.08637 1st Qu.:0.06492

Median :13.370 Median :18.84 Median : 86.24 Median : 551.1 Median :0.09587 Median :0.09263

Mean :14.127 Mean :19.29 Mean : 91.97 Mean : 654.9 Mean :0.09636 Mean :0.10434

3rd Qu.:15.780 3rd Qu.:21.80 3rd Qu.:104.10 3rd Qu.: 782.7 3rd Qu.:0.10530 3rd Qu.:0.13040

Max. :28.110 Max. :39.28 Max. :188.50 Max. :2501.0 Max. :0.16340 Max. :0.34540

concavity\_mean points\_mean symmetry\_mean dimension\_mean radius\_se texture\_se

Min. :0.00000 Min. :0.00000 Min. :0.1060 Min. :0.04996 Min. :0.1115 Min. :0.3602

1st Qu.:0.02956 1st Qu.:0.02031 1st Qu.:0.1619 1st Qu.:0.05770 1st Qu.:0.2324 1st Qu.:0.8339

Median :0.06154 Median :0.03350 Median :0.1792 Median :0.06154 Median :0.3242 Median :1.1080

Mean :0.08880 Mean :0.04892 Mean :0.1812 Mean :0.06280 Mean :0.4052 Mean :1.2169

3rd Qu.:0.13070 3rd Qu.:0.07400 3rd Qu.:0.1957 3rd Qu.:0.06612 3rd Qu.:0.4789 3rd Qu.:1.4740

Max. :0.42680 Max. :0.20120 Max. :0.3040 Max. :0.09744 Max. :2.8730 Max. :4.8850

perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se points\_se

Min. : 0.757 Min. : 6.802 Min. :0.001713 Min. :0.002252 Min. :0.00000 Min. :0.000000

1st Qu.: 1.606 1st Qu.: 17.850 1st Qu.:0.005169 1st Qu.:0.013080 1st Qu.:0.01509 1st Qu.:0.007638

Median : 2.287 Median : 24.530 Median :0.006380 Median :0.020450 Median :0.02589 Median :0.010930

Mean : 2.866 Mean : 40.337 Mean :0.007041 Mean :0.025478 Mean :0.03189 Mean :0.011796

3rd Qu.: 3.357 3rd Qu.: 45.190 3rd Qu.:0.008146 3rd Qu.:0.032450 3rd Qu.:0.04205 3rd Qu.:0.014710

Max. :21.980 Max. :542.200 Max. :0.031130 Max. :0.135400 Max. :0.39600 Max. :0.052790

symmetry\_se dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst

Min. :0.007882 Min. :0.0008948 Min. : 7.93 Min. :12.02 Min. : 50.41 Min. : 185.2

1st Qu.:0.015160 1st Qu.:0.0022480 1st Qu.:13.01 1st Qu.:21.08 1st Qu.: 84.11 1st Qu.: 515.3

Median :0.018730 Median :0.0031870 Median :14.97 Median :25.41 Median : 97.66 Median : 686.5

Mean :0.020542 Mean :0.0037949 Mean :16.27 Mean :25.68 Mean :107.26 Mean : 880.6

3rd Qu.:0.023480 3rd Qu.:0.0045580 3rd Qu.:18.79 3rd Qu.:29.72 3rd Qu.:125.40 3rd Qu.:1084.0

Max. :0.078950 Max. :0.0298400 Max. :36.04 Max. :49.54 Max. :251.20 Max. :4254.0

smoothness\_worst compactness\_worst concavity\_worst points\_worst symmetry\_worst dimension\_worst

Min. :0.07117 Min. :0.02729 Min. :0.0000 Min. :0.00000 Min. :0.1565 Min. :0.05504

1st Qu.:0.11660 1st Qu.:0.14720 1st Qu.:0.1145 1st Qu.:0.06493 1st Qu.:0.2504 1st Qu.:0.07146

Median :0.13130 Median :0.21190 Median :0.2267 Median :0.09993 Median :0.2822 Median :0.08004

Mean :0.13237 Mean :0.25427 Mean :0.2722 Mean :0.11461 Mean :0.2901 Mean :0.08395

3rd Qu.:0.14600 3rd Qu.:0.33910 3rd Qu.:0.3829 3rd Qu.:0.16140 3rd Qu.:0.3179 3rd Qu.:0.09208

Max. :0.22260 Max. :1.05800 Max. :1.2520 Max. :0.29100 Max. :0.6638 Max. :0.20750

**Summary(wbcd[c(“radius\_mean”,”area\_mean”,smoothness\_mean”)])**

**# Summarize the numeric features**

radius\_mean area\_mean smoothness\_mean

Min. : 6.981 Min. : 143.5 Min. :0.05263

1st Qu.:11.700 1st Qu.: 420.3 1st Qu.:0.08637

Median :13.370 Median : 551.1 Median :0.09587

Mean :14.127 Mean : 654.9 Mean :0.09636

3rd Qu.:15.780 3rd Qu.: 782.7 3rd Qu.:0.10530

Max. :28.110 Max. :2501.0 Max. :0.16340

**Str(wbcd) # Observations are repeating**

Classes ‘tbl\_df’, ‘tbl’ and 'data.frame': 569 obs. of 31 variables:

$ diagnosis : Factor w/ 2 levels "Benign","Malignant": 1 1 1 1 1 1 1 2 1 1 ...

$ radius\_mean : num 12.3 10.6 11 11.3 15.2 ...

$ texture\_mean : num 12.4 18.9 16.8 13.4 13.2 ...

$ perimeter\_mean : num 78.8 69.3 70.9 73 97.7 ...

$ area\_mean : num 464 346 373 385 712 ...

$ smoothness\_mean : num 0.1028 0.0969 0.1077 0.1164 0.0796 ...

$ compactness\_mean : num 0.0698 0.1147 0.078 0.1136 0.0693 ...

$ concavity\_mean : num 0.0399 0.0639 0.0305 0.0464 0.0339 ...

$ points\_mean : num 0.037 0.0264 0.0248 0.048 0.0266 ...

$ symmetry\_mean : num 0.196 0.192 0.171 0.177 0.172 ...

$ dimension\_mean : num 0.0595 0.0649 0.0634 0.0607 0.0554 ...

$ radius\_se : num 0.236 0.451 0.197 0.338 0.178 ...

$ texture\_se : num 0.666 1.197 1.387 1.343 0.412 ...

$ perimeter\_se : num 1.67 3.43 1.34 1.85 1.34 ...

$ area\_se : num 17.4 27.1 13.5 26.3 17.7 ...

$ smoothness\_se : num 0.00805 0.00747 0.00516 0.01127 0.00501 ...

$ compactness\_se : num 0.0118 0.03581 0.00936 0.03498 0.01485 ...

$ concavity\_se : num 0.0168 0.0335 0.0106 0.0219 0.0155 ...

$ points\_se : num 0.01241 0.01365 0.00748 0.01965 0.00915 ...

$ symmetry\_se : num 0.0192 0.035 0.0172 0.0158 0.0165 ...

$ dimension\_se : num 0.00225 0.00332 0.0022 0.00344 0.00177 ...

$ radius\_worst : num 13.5 11.9 12.4 11.9 16.2 ...

$ texture\_worst : num 15.6 22.9 26.4 15.8 15.7 ...

$ perimeter\_worst : num 87 78.3 79.9 76.5 104.5 ...

$ area\_worst : num 549 425 471 434 819 ...

$ smoothness\_worst : num 0.139 0.121 0.137 0.137 0.113 ...

$ compactness\_worst: num 0.127 0.252 0.148 0.182 0.174 ...

$ concavity\_worst : num 0.1242 0.1916 0.1067 0.0867 0.1362 ...

$ points\_worst : num 0.0939 0.0793 0.0743 0.0861 0.0818 ...

$ symmetry\_worst : num 0.283 0.294 0.3 0.21 0.249 ...

$ dimension\_worst : num 0.0677 0.0759 0.0788 0.0678 0.0677 ...

**Normalize<-function(x)**

**{**

**Return ((x-min(x))/max(x)-min(x)))**

**} # Create normalizing function**

**Wbcd\_n<-as.data.frame(lapply(wbcd[2:31],normalize))**

**# Applying the normalizing function**

**View(wbcd\_n) # After applying check all the columns**

**Summary(wbcd\_n) # Summary of the normalized dataset**

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean concavity\_mean

Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.00000

1st Qu.:0.2233 1st Qu.:0.2185 1st Qu.:0.2168 1st Qu.:0.1174 1st Qu.:0.3046 1st Qu.:0.1397 1st Qu.:0.06926

Median :0.3024 Median :0.3088 Median :0.2933 Median :0.1729 Median :0.3904 Median :0.2247 Median :0.14419

Mean :0.3382 Mean :0.3240 Mean :0.3329 Mean :0.2169 Mean :0.3948 Mean :0.2606 Mean :0.20806

3rd Qu.:0.4164 3rd Qu.:0.4089 3rd Qu.:0.4168 3rd Qu.:0.2711 3rd Qu.:0.4755 3rd Qu.:0.3405 3rd Qu.:0.30623

Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.00000

points\_mean symmetry\_mean dimension\_mean radius\_se texture\_se perimeter\_se

Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.00000 Min. :0.0000 Min. :0.00000

1st Qu.:0.1009 1st Qu.:0.2823 1st Qu.:0.1630 1st Qu.:0.04378 1st Qu.:0.1047 1st Qu.:0.04000

Median :0.1665 Median :0.3697 Median :0.2439 Median :0.07702 Median :0.1653 Median :0.07209

Mean :0.2431 Mean :0.3796 Mean :0.2704 Mean :0.10635 Mean :0.1893 Mean :0.09938

3rd Qu.:0.3678 3rd Qu.:0.4530 3rd Qu.:0.3404 3rd Qu.:0.13304 3rd Qu.:0.2462 3rd Qu.:0.12251

Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.00000 Max. :1.0000 Max. :1.00000

area\_se smoothness\_se compactness\_se concavity\_se points\_se symmetry\_se

Min. :0.00000 Min. :0.0000 Min. :0.00000 Min. :0.00000 Min. :0.0000 Min. :0.0000

1st Qu.:0.02064 1st Qu.:0.1175 1st Qu.:0.08132 1st Qu.:0.03811 1st Qu.:0.1447 1st Qu.:0.1024

Median :0.03311 Median :0.1586 Median :0.13667 Median :0.06538 Median :0.2070 Median :0.1526

Mean :0.06264 Mean :0.1811 Mean :0.17444 Mean :0.08054 Mean :0.2235 Mean :0.1781

3rd Qu.:0.07170 3rd Qu.:0.2187 3rd Qu.:0.22680 3rd Qu.:0.10619 3rd Qu.:0.2787 3rd Qu.:0.2195

Max. :1.00000 Max. :1.0000 Max. :1.00000 Max. :1.00000 Max. :1.0000 Max. :1.0000

dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst

Min. :0.00000 Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.00000 Min. :0.0000

1st Qu.:0.04675 1st Qu.:0.1807 1st Qu.:0.2415 1st Qu.:0.1678 1st Qu.:0.08113 1st Qu.:0.3000

Median :0.07919 Median :0.2504 Median :0.3569 Median :0.2353 Median :0.12321 Median :0.3971

Mean :0.10019 Mean :0.2967 Mean :0.3640 Mean :0.2831 Mean :0.17091 Mean :0.4041

3rd Qu.:0.12656 3rd Qu.:0.3863 3rd Qu.:0.4717 3rd Qu.:0.3735 3rd Qu.:0.22090 3rd Qu.:0.4942

Max. :1.00000 Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.00000 Max. :1.0000

compactness\_worst concavity\_worst points\_worst symmetry\_worst dimension\_worst

Min. :0.0000 Min. :0.00000 Min. :0.0000 Min. :0.0000 Min. :0.0000

1st Qu.:0.1163 1st Qu.:0.09145 1st Qu.:0.2231 1st Qu.:0.1851 1st Qu.:0.1077

Median :0.1791 Median :0.18107 Median :0.3434 Median :0.2478 Median :0.1640

Mean :0.2202 Mean :0.21740 Mean :0.3938 Mean :0.2633 Mean :0.1896

3rd Qu.:0.3025 3rd Qu.:0.30583 3rd Qu.:0.5546 3rd Qu.:0.3182 3rd Qu.:0.2429

Max. :1.0000 Max. :1.00000 Max. :1.0000 Max. :1.0000 Max. :1.0000

**Wbcd\_train<-wbcd\_n[1:469,] # Create training dataset**

**Wbcd\_test<-wbcd\_n[470:569,] # Create testing dataset**

**Wbcd\_train\_labels<-wbcd[1:469,1] # Create label for training datset**

**Wbcd\_test\_labels<-wbcd[4701;569,1] # Create label for testing dataset**

**Library(class) # Loading the class library**

**Wbcd\_train\_labels<-wbcd\_train\_labels[[“diagnosis”]]**

**# Create training datset label as diagnosis**

**Wbcd\_test\_labels<-wbcd\_test\_labels[[“diagnosis”]]**

**# Create testing datset label as diagnosis**

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,**

**Cl=wbcd\_train\_labels,k=23)**

**# Predict the algorithm by using knn**

**Library(gmodels) # Load the gmodels library**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,**

**Prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 61 | 0 | 61 |

| 1.000 | 0.000 | 0.610 |

| 0.953 | 0.000 | |

| 0.610 | 0.000 | |

-----------------|-----------|-----------|-----------|

Malignant | 3 | 36 | 39 |

| 0.077 | 0.923 | 0.390 |

| 0.047 | 1.000 | |

| 0.030 | 0.360 | |

-----------------|-----------|-----------|-----------|

Column Total | 64 | 36 | 100 |

| 0.640 | 0.360 | |

-----------------|-----------|-----------|-----------|

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,**

**Cl=wbcd\_train\_labels,k=2)**

**# Re-classify the test cases**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,**

**Prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 59 | 2 | 61 |

| 0.967 | 0.033 | 0.610 |

| 0.967 | 0.051 | |

| 0.590 | 0.020 | |

-----------------|-----------|-----------|-----------|

Malignant | 2 | 37 | 39 |

| 0.051 | 0.949 | 0.390 |

| 0.033 | 0.949 | |

| 0.020 | 0.370 | |

-----------------|-----------|-----------|-----------|

Column Total | 61 | 39 | 100 |

| 0.610 | 0.390 | |

-----------------|-----------|-----------|-----------|

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,cl=wbcd\_train\_label s,k=1) # Re-classify the test case at k=1**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual at k=1**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 58 | 3 | 61 |

| 0.951 | 0.049 | 0.610 |

| 0.983 | 0.073 | |

| 0.580 | 0.030 | |

-----------------|-----------|-----------|-----------|

Malignant | 1 | 38 | 39 |

| 0.026 | 0.974 | 0.390 |

| 0.017 | 0.927 | |

| 0.010 | 0.380 | |

-----------------|-----------|-----------|-----------|

Column Total | 59 | 41 | 100 |

| 0.590 | 0.410 | |

-----------------|-----------|-----------|-----------|

**# ACCURACY=96%**

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,cl=wbcd\_train\_label s,k=5) # Re-classify the test case at k=5**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual at k=5**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 61 | 0 | 61 |

| 1.000 | 0.000 | 0.610 |

| 0.968 | 0.000 | |

| 0.610 | 0.000 | |

-----------------|-----------|-----------|-----------|

Malignant | 2 | 37 | 39 |

| 0.051 | 0.949 | 0.390 |

| 0.032 | 1.000 | |

| 0.020 | 0.370 | |

-----------------|-----------|-----------|-----------|

Column Total | 63 | 37 | 100 |

| 0.630 | 0.370 | |

-----------------|-----------|-----------|-------

**# ACCURACY=98%**

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,cl=wbcd\_train\_label s,k=11) # Re-classify the test case at k=11**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual at k=11**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 61 | 0 | 61 |

| 1.000 | 0.000 | 0.610 |

| 0.953 | 0.000 | |

| 0.610 | 0.000 | |

-----------------|-----------|-----------|-----------|

Malignant | 3 | 36 | 39 |

| 0.077 | 0.923 | 0.390 |

| 0.047 | 1.000 | |

| 0.030 | 0.360 | |

-----------------|-----------|-----------|-----------|

Column Total | 64 | 36 | 100 |

| 0.640 | 0.360 | |

-----------------|-----------|-----------|-----------|

**# ACCURACY=97%**

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,cl=wbcd\_train\_label s,k=15) # Re-classify the test case at k=15**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual at k=15**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 61 | 0 | 61 |

| 1.000 | 0.000 | 0.610 |

| 0.953 | 0.000 | |

| 0.610 | 0.000 | |

-----------------|-----------|-----------|-----------|

Malignant | 3 | 36 | 39 |

| 0.077 | 0.923 | 0.390 |

| 0.047 | 1.000 | |

| 0.030 | 0.360 | |

-----------------|-----------|-----------|-----------|

Column Total | 64 | 36 | 100 |

| 0.640 | 0.360 | |

-----------------|-----------|-----------|-----------|

**# ACCURACY=97%**

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,cl=wbcd\_train\_label s,k=21) # Re-classify the test case at k=21**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual at k=21**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 61 | 0 | 61 |

| 1.000 | 0.000 | 0.610 |

| 0.968 | 0.000 | |

| 0.610 | 0.000 | |

-----------------|-----------|-----------|-----------|

Malignant | 2 | 37 | 39 |

| 0.051 | 0.949 | 0.390 |

| 0.032 | 1.000 | |

| 0.020 | 0.370 | |

-----------------|-----------|-----------|-----------|

Column Total | 63 | 37 | 100 |

| 0.630 | 0.370 | |

-----------------|-----------|-----------|-----------|

**# ACCURACY=98%**

**Wbcd\_test\_pred<-knn(train=wbcd\_train,test=wbcd\_test,cl=wbcd\_train\_label s,k=27) # Re-classify the test case at k=27**

**Crosstable(x=wbcd\_test\_labels,y=wbcd\_test\_pred,prop.chisq=FALSE)**

**# Create the crosstable of pred vs actual at k=27**

Cell Contents

|-------------------------|

| N |

| N / Row Total |

| N / Col Total |

| N / Table Total |

|-------------------------|

Total Observations in Table: 100

| wbcd\_test\_pred

wbcd\_test\_labels | Benign | Malignant | Row Total |

-----------------|-----------|-----------|-----------|

Benign | 61 | 0 | 61 |

| 1.000 | 0.000 | 0.610 |

| 0.938 | 0.000 | |

| 0.610 | 0.000 | |

-----------------|-----------|-----------|-----------|

Malignant | 4 | 35 | 39 |

| 0.103 | 0.897 | 0.390 |

| 0.062 | 1.000 | |

| 0.040 | 0.350 | |

-----------------|-----------|-----------|-----------|

Column Total | 65 | 35 | 100 |

| 0.650 | 0.350 | |

-----------------|-----------|-----------|-----------|

**# ACCURACY=96%**

### **OBSERVATIONS:**

* **Acuuracy at k=1 is 96%**
* **Acuuracy at k=5 is 98%**
* **Acuuracy at k=11 is 97%**
* **Acuuracy at k=15 is 97%**
* **Acuuracy at k=21 is 98%**
* **Accuracy at k=27 is 96%**

**In KNN algorithm at value of k=5,21 we have to give the more accuracy**